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I, LEANNE MYNOTT, MANAGER EXAMINATION SUPPORT AND SALES hereby certify that annexed is a true copy of the Provisional specification in connection with Application No. 2003906634 for a patent by SNOW FACTORIES PTY LTD as filed on 28 November 2003.

WITNESS my hand this
Fourteenth day of December 2004

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Regulation 3.2

AUSTRALIA

Patents Act 1990

PROVISIONAL SPECIFICATION

Invention Title: **Snow making method and apparatus**

The invention is described in the following statement:

SNOW MAKING METHOD AND APPARATUS

Field of the Invention

The present invention relates to a snow making apparatus and a method for making snow or a snow-like substance. In particular, although not exclusively, the invention relates to a type of snow making apparatus, where snow is made within flexible-walled tubes by fluid transfer from a cooling medium surrounding the tubes.

Background of the Invention

International Patent Application WO 02/37039 describes a snow making method and apparatus utilising a tank which is filled with liquid coolant. A number of flexible hoses are disposed within the tank. The hoses are filled with water and, through the process of heat transfer from the coolant, ice crystals form within the hoses. The hoses are periodically inflated to aid in dislodging the snow or ice crystals from the inner wall surfaces of the hoses. After each inflation, the hoses are permitted to deflate and this is aided by the pressure of the coolant in the tank.

One difficulty with this arrangement is that while snow and/or ice crystals are intended to form on the inner walls of the hoses, there is a risk that the ice crystals can form a solid block of ice which, once formed is difficult to dislodge. If the hoses should freeze up then it may be necessary to remove the coolant from the tank and allow the ice block within the hoses to melt or alternatively to physically break up the ice. This inevitably leads to downtime for the snow making apparatus and is also time consuming and physically demanding for the operator.

It is therefore an object of the present invention to provide a snow making apparatus and/or a method of making snow or a snow substitute which addresses some of the aforementioned difficulties. An alternative object is to provide the public with a useful choice.

Summary of the Invention

In accordance with a first aspect of the present invention, there is provided a snow making apparatus including:

a container having a cooling space adapted to contain pressurized air or gas; and

at least one flexible walled vessel extending through the cooling space, the at least one vessel being connectable to a water source, wherein the apparatus is operable to maintain the cooling space at a sufficiently low temperature to at least partially freeze the water within the flexible walled vessel, while periodically and temporarily increasing the pressure within the container to compress the flexible walled vessel.

Additionally, the apparatus may include a detachment means to aid in detaching ice crystals and/or snow from the internal walls of the vessel. The detachment means may comprise a mechanical device such as rollers to compress the at least one vessel. Alternatively, the detachments may comprise an inflation means to cyclically or intermittently at least partially inflate the at least one vessel to effect dislodgement of the snow and/or ice crystals from the inner walls of the vessel. Suitably, the inflation means includes an air release means to release the air from the vessel and permit deflation. While the use of pressurized air has been described, other gases may be substituted for air. The cyclic rate of inflation and deflation may be dependent upon the rate of generation of the snow and/or ice crystals within the at least one vessel.

The apparatus may be operable to pressurize the container coincident with the deflation of the at least one vessel. The pressure increase may coincide with each cyclic deflation of the at least one vessel. However, in a most preferred form of the invention, the pressure increase coincides with the deflation of the at least one vessel after every 10 to 15 cycles. This periodic increase of pressure provides greater effectiveness in breaking up the ice crystals within the vessel.

Additionally, the cooling space within the container may be maintained at a static pressure of approximately 2kPa. The increased pressure may be approximately 15kPa.

Another preferred feature of the invention is the inclusion of spray nozzles to spray a cooling medium onto the at least one vessel. The cooling medium may comprise a liquid such as brine or any other coolant. The cooling medium may be maintained at a low temperature through the use of a refrigeration apparatus.

The flexible walled vessel may comprise a hose, pipe, tube, conduit or the like. However, the vessel is not restricted to being elongate in form and may comprise any shape appropriate for effective heat transfer. Preferably, the vessel is constituted of material(s) which are water impervious, inflatable and capable of remaining pliable at low temperatures. Preferably, the hoses have a smooth inner lining constituted of materials such as Teflon (trade mark), polyurethane, nylon or like plastics or rubber materials resistant to ice formation. The inner walls of the hoses may be coated with a non-stick coating such as linseed oil. Additionally, protective outer layers of the vessels may be provided. Such outer layers may comprise flexible material or fibres, including thin-walled polypropylene, plastic, fabric or metal fibres.

Suitably, there may be a plurality of vessels and the vessels may be held by frame work within the container.

The container may be in the form of a pressurizable tank or a pressure vessel. Preferably, the container has insulated walls.

While it has been indicated in the invention that the flexible walled vessels are connectable to a source of water, it will be understood that the term "water" may include mixtures of water with other ingredients such as mixtures of water with surfactants.

The apparatus may also include discharge means to discharge the snow and/or ice crystals from the vessel. For this purpose, the vessel may include an opening with a sealing means across the opening. The discharge means may effect opening of the sealing means to allow discharge through the opening. The

discharge means may operate in combination with the inflation means with the pressurized air/gas assisting in the flushing of snow and/or ice crystals through the vessel and out through the opening.

In accordance with a second aspect of the present invention, there is method a provided for making snow or a snow-like substance, comprising:

providing a container having a cooling space containing a fluid comprising substantially air with at least one flexible walled vessel extending through the cooling space;

connecting the at least one flexible walled vessel to a source of fluid comprising substantially water;

maintaining the cooling space at a sufficiently low temperature to at least partially freeze the fluid within the flexible walled vessel; and

periodically and temporarily increasing the pressure within the container to compress the flexible walled vessel.

Any of the features described above in connection with the first aspect of the invention may be implemented in the method of the second aspect.

In accordance with a third aspect of the present invention there is provided a snow making apparatus including:

at least one flexible walled vessel connectable to a water source;

means for spraying coolant onto the flexible walled vessel.

In accordance with the fourth aspect of the present invention there is provided a method for making snow or a snow like substance comprising:

providing at least one flexible walled vessel;

connecting the at least one flexible walled vessel to a source of fluid comprising substantially water;

spraying coolant onto the flexible walled vessel.

The method may also include manipulating the vessel to detach ice crystals from the inner wall of the vessel. The manipulation may be provided by inflating the flexible walled vessel by a source of pressurized gas applied internally to the vessel. The gas, which may be air may be permitted to bleed from the vessel to allow deflation. Furthermore, the flexible walled vessel may be subjected to external pressurization, for example, by being held within a pressure vessel, to assist in compressing the flexible walled vessel.

As mentioned above, the flexible walled vessel may be housed within a container such as a pressure vessel. The container may include a catchment for the coolant to enable reuse. The method may also comprise discharging the snow or snow like substance from within the vessel out through an opening. Any of the features described above in connection with the first aspect of the invention may be applied to the third and fourth aspects of the invention.

This invention may also be said broadly to consist in the parts, elements and features referred to or indicated in the specification of the application, individually or collectively, and any or all combinations of any two or more of said parts , elements or features, and where specific integers are mentioned herein which have known equivalents in the art to which this invention relates, such known equivalents are deemed to be incorporated herein as if individually set forth.

Preferred Embodiment

In order that the invention may be more fully understood, one embodiment will now be described by way of example with reference to Figure 1 which is a schematic view of a snowmaking apparatus 10. The snowmaking apparatus comprises a container such as pressure vessel 12 which defines a cooling space 13. Extending through the cooling space are a number of flexible walled vessels such as tubes 14 of which only one is shown in the figure. The tubes 14 are connected to a water source as well as a source of pressurised air through inlet 16.

The pressure vessel 12 also includes a plurality of spray nozzles 18 which operate to spray coolant such as glycol onto the tubes 14. Additionally, the cooling

space 13 is pressurised to about 2 kPa through the pressurising gas inlet 20. The conditions within the pressure vessel 12 are such that water within the tubes 14 is caused to freeze or to form snow and/or ice crystals on the internal walls of the tubes through the process of heat transfer through the walls of the tube. The interior of the flexible tubes is cyclically inflated and deflated to assist with the removal of the snow and/or ice crystals from the walls of the tubes. The end of each tube opposite the water and air inlet is provided with a snow and air release valve 20. The valve 20 allows the pressurised air to bleed from the tube to permit cyclic deflation of the tube 14. As mentioned above, the cooling space is generally maintained at a static pressure of 2 kPa during the cyclic inflation and deflation. However, every 10-15 cycles, the pressure is temporarily increased to approximately 15 kPa, coincident with the deflation of the flexible tubes 14. This increased pressure serves to break up any ice which has formed into blocks within the tubes 14. Once the process has continued for a time sufficient to cause most of the water within the tubes to form snow or ice crystals, the valve 20 is fully opened and pressurised air through inlet 16 assists with evacuating the snow and/or ice crystals from the tubes 14.

The foregoing describes only one embodiment of the present invention and modifications may be made thereto without departing from the scope of the present invention.

Snow Factories Pty Ltd

By their Registered Patent Attorneys

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26 November 2003

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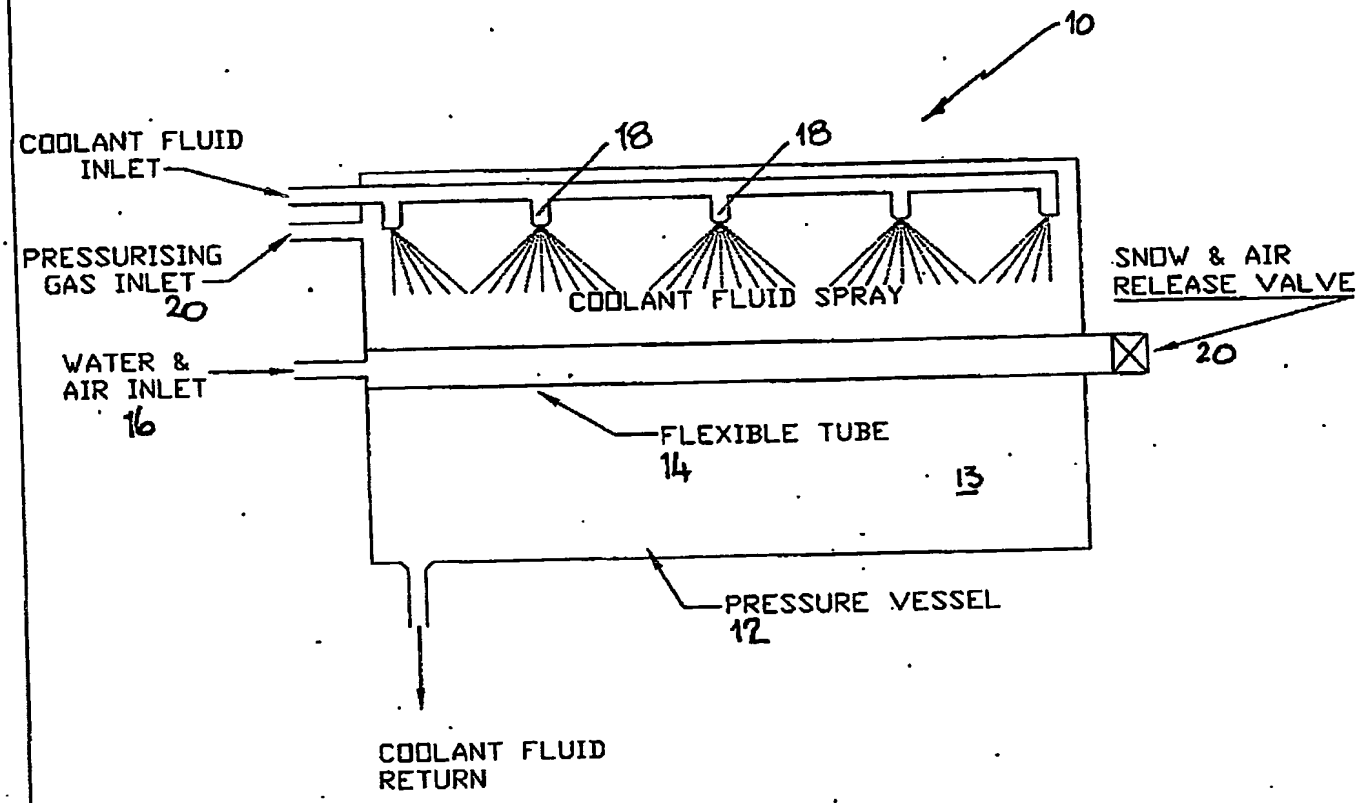

FIG. 1

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